# CLAIMS

1. A brushless DC motor coupled directly to an AC source, the motor comprising:

(a) a stator including a stator coil;

(b) a rotor including a rotor magnet;

(c) a magnetic flux sensor for sensing a distribution of magnetic-flux density of the rotor magnet;

(d) an inverter circuit including a plurality of switching elements coupled in a full-wave bridge having an upper arm and a lower arm;

(e) an AC source coupler;

(f) a rectifier for full-wave rectifying a voltage of the AC source;

(g) a DC voltage converter for converting a rectified voltage supplied from the rectifier into a flat and low DC voltage, and for applying the flat and low DC voltage to the inverter circuit as a power supply; and

(h) a controller for controlling the inverter circuit based on a signal supplied from the magnetic flux sensor such that the low DC voltage is supplied to the stator coil in a full-wave driving method.

2. A brushless DC motor coupled directly to an AC source, the motor comprising:

(a) a stator including a stator coil;

(b) a rotor including a rotor magnet;

(c) a magnetic flux sensor for sensing a distribution of magnetic-flux density of the rotor magnet;

(d) an inverter circuit including a plurality of switching elements coupled in a full-wave bridge having an upper arm and a lower arm;

(e) an AC source coupler;

(f) a rectifier for full-wave rectifying a voltage of the AC source;

(g) a DC voltage converter for converting a rectified voltage supplied from the rectifier into a flat and low DC voltage, and for applying the flat and low DC voltage to the inverter circuit as a power supply;

(h) a controller for pulse width modulation (PWM) controlling some of the switching elements disposed one of the upper arm and the lower arm of the inverter circuit, and for controlling the inverter circuit based on a signal supplied from the magnetic flux sensor such that the low DC voltage is supplied to the stator coil in a full-wave driving method; and

(i) a duty instructing means for giving an instruction about an ON/OFF duty of the PWM to the inverter circuit.

3. The brushless DC motor of claim 1 or claim 2,

wherein the magnetic flux sensor is placed such that a waveform of a distribution of magnetic flux density becomes similar to a voltage waveform induced in the stator coil by the rotor magnet, and

wherein the controller further includes a current waveform controller for shaping a current waveform of the stator coil similar to a waveform sensed by the magnetic flux sensor.

4. The brushless DC motor of claim 1 or claim 2,

wherein the magnetic flux sensor further includes a synthesizer for synthesizing a waveform of two phases out of waveforms sensed by the magnetic flux sensor; and

wherein the controller further includes a current waveform controller for shaping a current waveform of the stator coil into a waveform

similar to the synthesized waveform.

5. The brushless DC motor of claim 1 or claim 2, wherein the rotor magnet is a pole-anisotropic magnet.

6. The brushless DC motor of claim 1 or claim 2 further comprising a current controller for regulating an average current of the inverter circuit constantly at a set current.

7. The brushless DC motor of claim 1 or claim 2 further comprising:

a current instructing means for instructing an average current of the inverter circuit;

a current controller for regulating the average current of the inverter circuit at a value instructed; and

an output means for outputting a signal of a motor rpm based on a signal supplied from the magnetic flux sensor,

wherein the current instructing means instructs the inverter circuit to change the average current in response to the motor rpm.

8. The brushless DC motor of claim 1 or claim 2 further comprising:

a current instructing means for instructing an average current of the inverter circuit;

a current controller for regulating the average current of the inverter circuit at a value instructed;

an output means for outputting a signal of a motor rpm based on a signal supplied from the magnetic flux sensor; and

an rpm range sensor for sensing a range of rpm, which range

covers an rpm of the motor,

wherein the current instructing means instructs the inverter circuit to change the average current in response to the range of the rpm.

9. The brushless DC motor of claim 1 or claim 2 further comprising a DC voltage changer for changing a low DC voltage supplied from the DC voltage converter,

wherein the AC source coupler includes a plurality of terminals, and

wherein the DC voltage changer changes the low DC voltage in response to which terminal of the AC source coupler is coupled to the AC source.

10. The brushless DC motor of claim 6 further comprising a set current changer for changing the set current;

wherein the AC source coupler includes a plurality of terminals, and

wherein the current changer changes the set current in response to which terminal of the AC source coupler is coupled to the AC source.

11. The brushless DC motor of claim 7, wherein the AC source coupler includes a plurality of terminals,

wherein the current instructing means changes the average current of the inverter circuit in response to the motor rpm depending on which terminal of the AC source coupler is coupled to the AC source.

12. The brushless DC motor of claim 8, wherein the AC source coupler includes a plurality of terminals,

wherein the current instructing means changes the average current of the inverter circuit in response to the range of the rpm depending on which terminal of the AC source coupler is coupled to the AC source.

13. The brushless DC motor of claim 1 or claim 2 further comprising a voltage reducing means disposed outside the motor via a terminal, wherein the low DC voltage supplied from the DC voltage converter is applied as a power supply to the inverter circuit via the voltage reducing means disposed outside the motor.

14. The brushless DC motor of claim 2 further comprising a voltage reducing means disposed outside the motor via a terminal, wherein a voltage reduced from the low DC voltage supplied from the DC voltage converter is applied, via the voltage reducing means disposed outside the motor, to the controller as a signal voltage that gives the inverter circuit an instruction about the ON/OFF duty of the PWM.

15. The brushless DC motor of claim 1 or claim 2 further comprising:

a current instructing means for instructing an average current of the inverter circuit;

a current controller for regulating the average current of the inverter circuit at a value instructed; and

a terminal for coupling a voltage reducing means to an outside of the motor,

wherein a signal voltage which gives an instruction about the average current to the inverter circuit is applied to the current instructing means via the voltage reducing means disposed outside the motor.

16. The brush-less DC motor of claim 15, wherein the signal voltage instructs the inverter circuit one of to run a constant current, to change a current in response to a motor rpm, and to change a current in response to a range of a motor rpm.

17. An electric apparatus in which the brushless DC motor as defined in claim 1 or claim 2 is mounted.